



# **Aeromedical Lessons Learned from the Space Shuttle Columbia Accident Investigation**

**Update 2011**



# Introduction

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- Today our panel will provide you with an update on the Columbia accident response presented in 2005 with additional information that was not available at that time.
- Some of you may already know some of the details, but others may not.
- I will provide an introduction and my colleagues will provide information on the following topics:



# Introduction Continued

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- Dr. Stepaniak, the Lead Shuttle Crew Surgeon at JSC, has worked 28 STS missions and was the Medical Mishap Investigation Team (MIT) Lead for STS-107. He will provide an overview of the medical response and Search & Rescue.
- Ms. Shafer, Deputy Chief Counsel at JSC, who provided legal support to the Columbia Task Force, will provide medico-legal issues associated with the accident.
- Dr. Packham, Associate Director of Safety and Mission Assurance and Deputy Manager Flight Safety Office at JSC will provide information on the Spacecraft Crew Survival Integrated Investigation Team Report published in 2008.
- Mr. Patlach, a member of the JSC Space Medicine Division Contingency Team who supported the MIT from the Disaster Field Office, will provide information on future NASA flight surgeon spacecraft accident response training.



# STS- 107 CREW



**David Brown**

**Laurel Clark**

**Michael Anderson**

**Ilan Ramon**

**Rick Husband**

**Kalpana Chawla**

**William McCool**



# Launch January 16, 2003



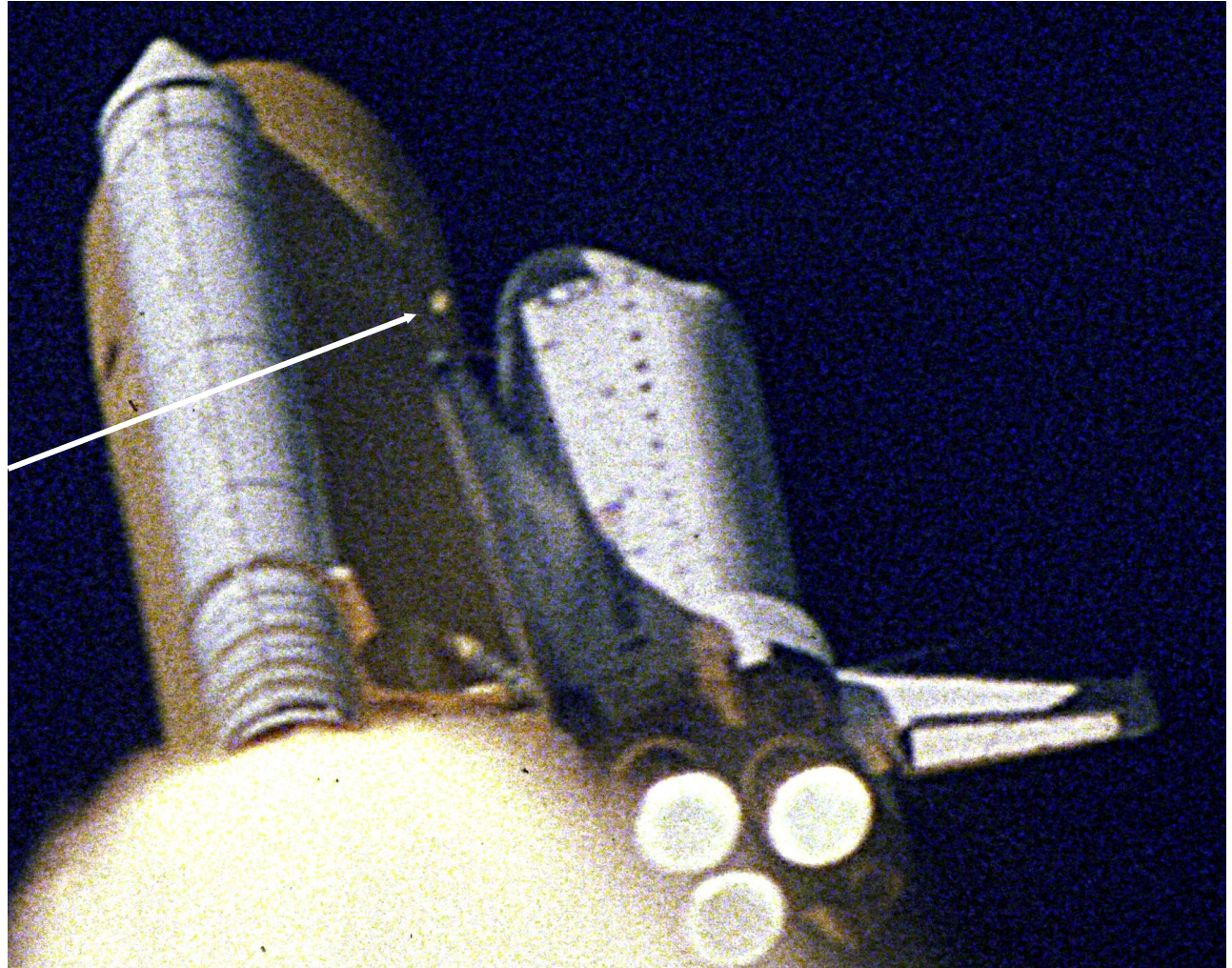
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# Columbia Launch Foam Separation

- High Contrast: good size comparison
- Early in fall (81.7 sec); little motion blur acquired
- Known size: ~24" x 15"
- 1.67 Pounds

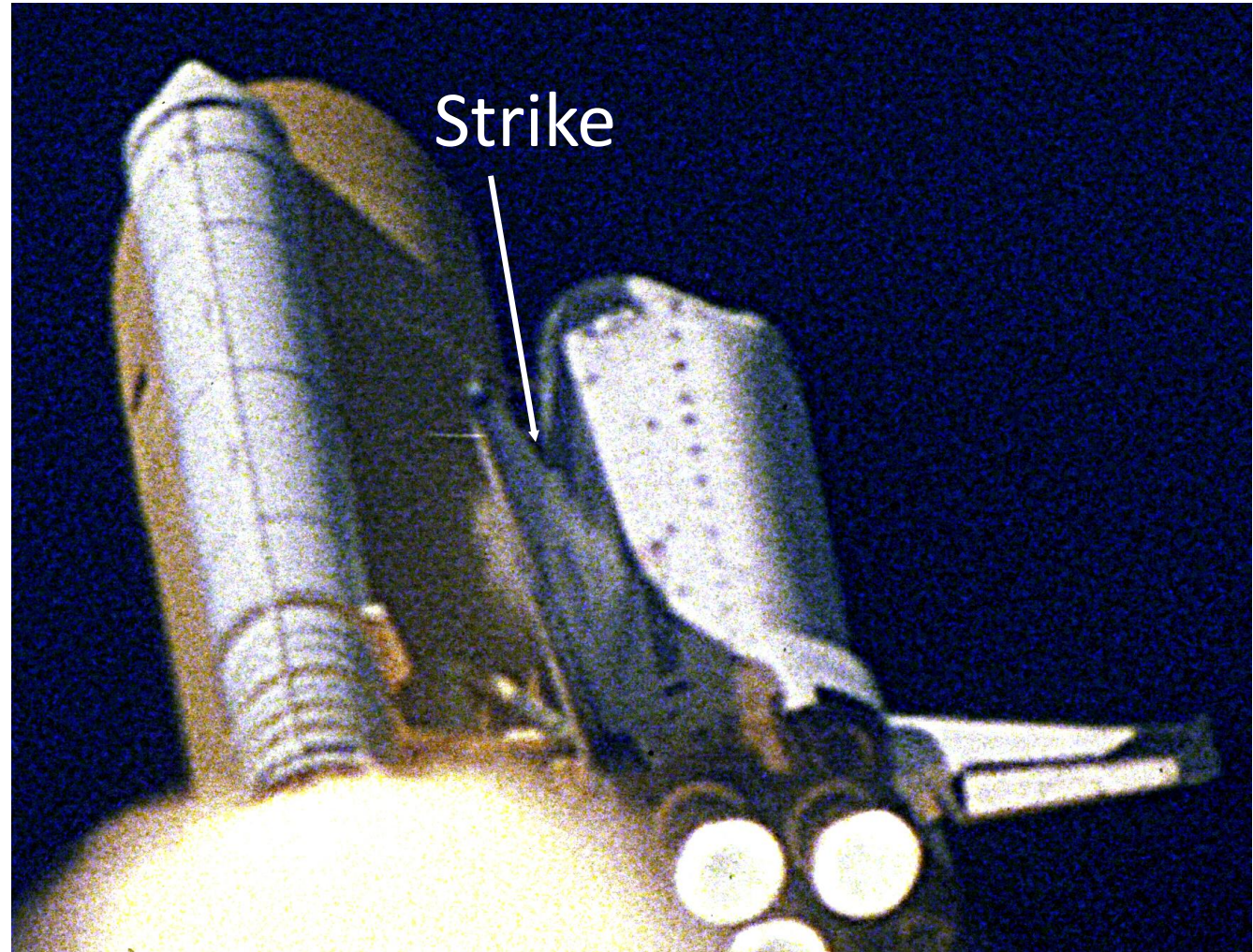






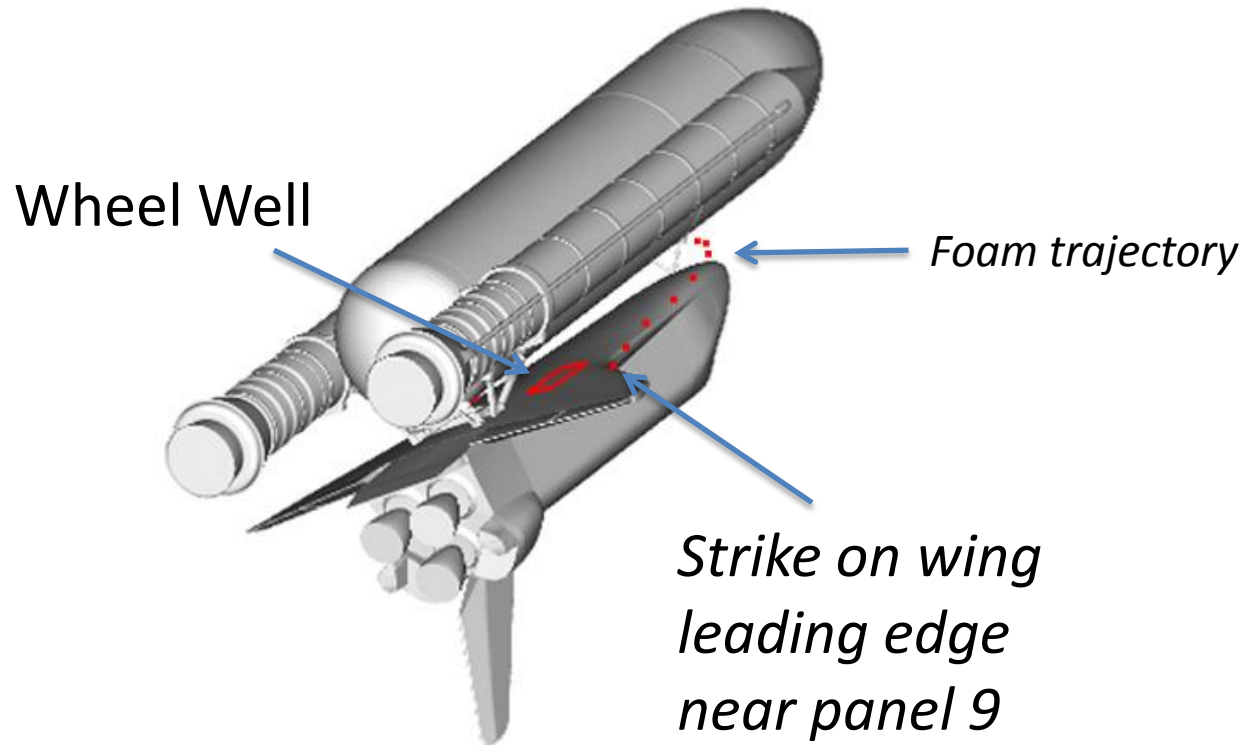
# The Orbiter “Ran Into” the Foam

- Foam Speed 1,105 MPH
- Orbiter Mach 2.46 (1650 MPH)
- Relative Velocity 545 MPH (like dropping a 16# bowling ball from 2<sup>nd</sup> floor)
- 81.9 seconds after launch
- Altitude 65,820 feet





# Simulation based on AutoCad Overlay







# Launch

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# FOAM TEST

Conducted at Southwest  
Research Institute  
San Antonio, Texas

1.67 lb foam test  
projectile impacted the  
panel at 777 ft/sec which  
created a hole 16 in. x  
17in.





# STS 107 Entry







# STS 107 Breakup

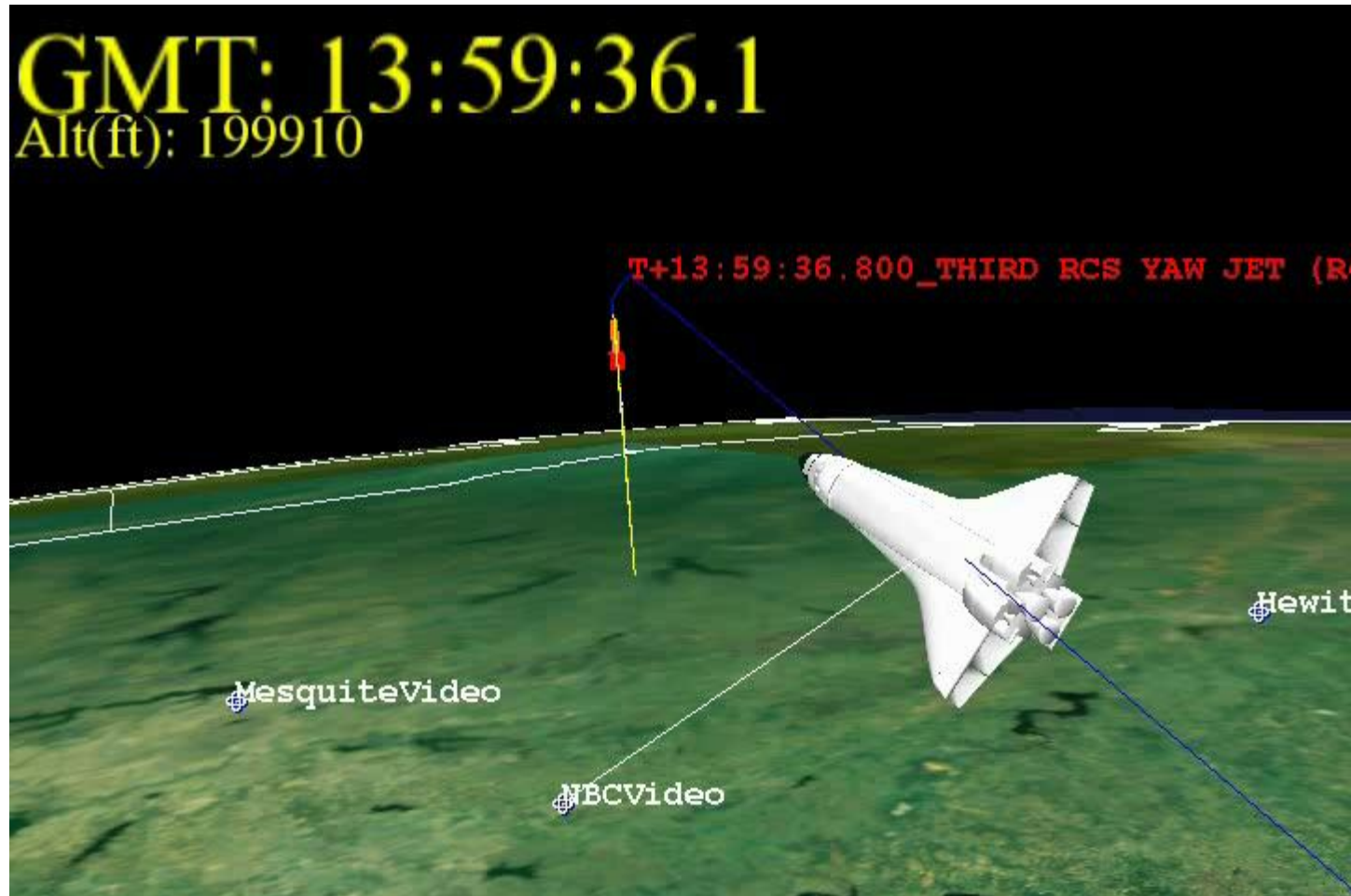
## Infrared Camera Images

Images captured by a Danish aircrew in an AH-64 Apache helicopter near Fort Hood, TX



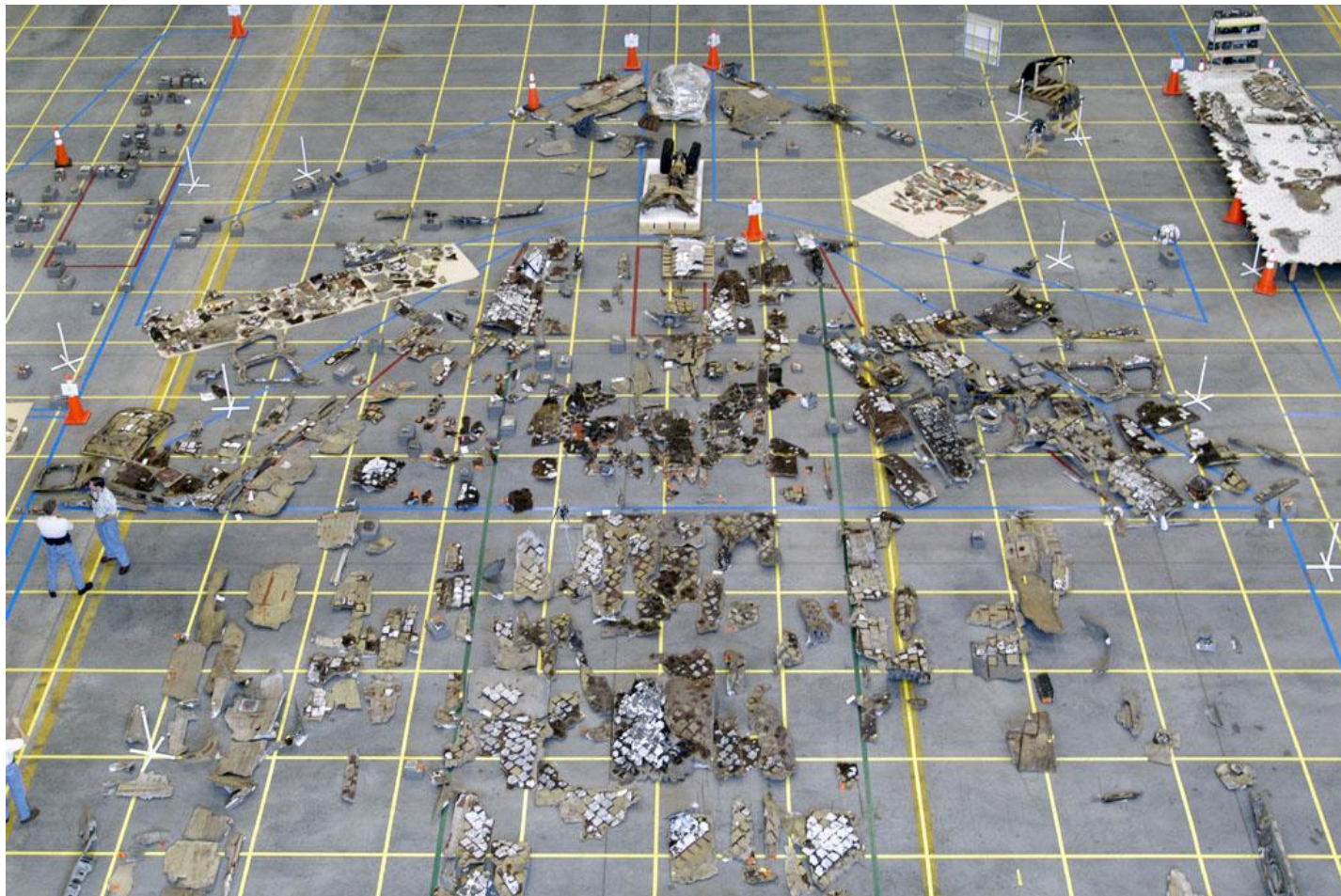


# STS 107 Breakup





# View of Reconstruction Grid 6/4/03







# Debris Recovery Facts

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- Furthest west recovered debris - Littlefield Texas.
- Over 30,000 people, over 1.5 million person-hours.
- 37+ helicopters, 7+ fixed-wing aircraft.
- 700,000 acres searched on foot, 1,600,000 acres searched from air. Equivalent to 1.25 mi. wide track from Seattle to Boston.
- 83,800 debris pieces recovered, 83,013 found to be from Columbia.
- 84,900 lbs recovered, or 39% of calculated vehicle dry weight at entry interface.
- At peak, 75 engineers and technicians worked two shifts, six days per week, expending more than 144,000 person-hours in the reconstruction hangar alone.
- 2,800 pieces placed on debris grid at KSC.
- Debris shipments ran from 2/15/03 through 5/6/03.
- This was the largest such search ever carried out in the U.S. and probably the world.



# Introduction of Dr. Stepaniak

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- Now Dr. Stepaniak will provide an overview of the medical response and Search & Rescue.